

## Improvements in the production of thermistor devices

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**Applicant:** GRACE W R & CO  
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### Abstract of GB1002704

1,002,704. Thermistors. W. R. GRACE & CO. Oct. 28, 1963 [Dec. 14, 1962], No. 42490/63. Drawings to Specification. Heading H1K. A process for preparing thermistor devices comprises doping a monocrystalline high purity P-type silicon rod with between 1 and 1500 parts of gold per 10<SP>9</SP> of silicon by means of a zone levelling technique. A rod of silicon having an impurity content of less than 1 part in 10<SP>9</SP> is placed in a zone-melting apparatus together with a P-type silicon seed crystal (resistivity 20-50 ohm cm.) and a quantity of very high purity gold. These materials are subjected to a zone melting process whereby a monocrystalline rod of silicon having a uniform distribution of gold (preferably 50- 1000 parts per 10<SP>9</SP>) therein is obtained. The rod is cut into wafers by means of a diamond saw and the resulting wafers are then etched and washed. Aluminium is deposited on to the wafers by means of flash heating in a vacuum ( $8.5 \times 10^{-5}$  mm. Hg). The wafers are then heated in an inert atmosphere (helium, argon or nitrogen) at between 580 and 630 C. for 20 minutes in order to alloy the aluminium and silicon together. The wafers are etched, washed and then transferred via an ammonium hydroxide bath to an electrodeless nickel-plating tank. After deposition of the nickel the wafers are heat treated at 210 C. for 18 hours in an argon or nitrogen atmosphere. The wafers are then sliced using an ultrasonic saw and tinned copper leads are soldered to each of the dice. The edges of the dice are ground away to remove any surplus metal which may be short-circuiting the electrodes and to adjust the resistance value to be equal to that of a standard thermistor. The devices are finally painted with a white silicone enamel or with vulcanized silicone rubber.

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